**Data structures and algorithms simulator**

SE-A-2

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Understanding data structures and algorithms is essential for computer science students, yet mastering these concepts often presents significant challenges. This project enhances Visualization Zone of Understanding (VZOU), an educational platform designed to improve comprehension and engagement through personalized learning paths, dynamic visualizations, and gamification. The system integrates adaptive learning mechanisms and leverages Bloom’s taxonomy to structure progression. A controlled study involving 45 students evaluated 3 system versions. The personalized version resulted in significantly higher test scores, accompanied by increased cognitive load. No statistically significant differences were found in usability (SUS) or task completion time across groups.

Keywords: adaptive learning, algorithms, data structures, gamification, visualization.